

12/31/98  
jc612 U.S. PTO

A

Patent  
239/104

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Anticipated Classification of this application:  
Class \_\_\_\_\_ Subclass \_\_\_\_\_  
Prior application: 08/876,775  
Examiner: Banks-Harold, M.  
Art Unit: 2745

jc588 U.S. PTO  
09/22/97  
12/31/98

BOX PATENT APPLICATION  
Assistant Commissioner for Patents  
Washington, D.C. 20231

FILING UNDER 37 CFR 1.53(B)

This is a request for filing for a

☒ continuation ☐ divisional

application under 37 C.F.R. 1.53(b) of pending prior application Serial No. 08/876,775, filed on June 16, 1997, which is a continuation of application Serial No. 08/410,901, filed on March 27, 1995, now U.S. Patent No. 5,640,674, which is a continuation of application Serial No. 07/682,050 filed on April 8, 1991, now U.S. Patent No. 5,402,413, of

Robert C. Dixon

for: WIRELESS CELLULAR COMMUNICATION SYSTEM (AS AMENDED)

1. COPY OF PRIOR APPLICATION AS FILED WHICH IS ATTACHED

☒ I hereby verify that the attached papers are a true and complete copy of what is shown in my records to be the above-identified prior application, including the oath or declaration as originally filed. (37 CFR 1.53)

13 Pages of Specification  
3 Pages of Claims  
1 Pages of Abstract  
2 Sheets of Drawings X formal     Informal  
2 Pages of Declaration  
1 Page of Power of Attorney  
    Small Entity Statement

CERTIFICATE OF MAILING (37 C.F.R. §1.10)

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as 'Express Mail Post Office To Addressee' (Label No. EM 351251479 US) in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

December 31, 1998  
Date of Deposit  
LA-66277.1

Connie Kwon  
Connie Kwon

- ☒ In accordance with the indication required by 37 CFR 1.53(b), my records reflect that the original signed declaration showing applicant's signature was filed on May 31, 1991.
- ☐ The amendment referred to in the declaration filed to complete the prior application, and I hereby state, in accordance with the requirements of 37 CFR 1.53(b), that this amendment did not introduce new matter therein.

## 2. AMENDMENTS

- ☐ Cancel in this application original Claims \_\_\_\_\_ of the prior application before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)
- ☒ A Preliminary Amendment is enclosed. (Claims added by Amendment must be numbered consecutively beginning with the number next following the highest numbered original claim in the prior application.)

## 3. INFORMATION DISCLOSURE STATEMENT

- ☒ An Information Disclosure Statement, PTO 1449, and copies of the references are not enclosed, as each of the items was cited by or submitted to the Patent Office in one of prior applications from which priority is claimed under 35 U.S.C. §120.

## 4. PETITION FOR SUSPENSION OF PROSECUTION FOR THE TIME TO FILE AN AMENDMENT

- ☐ There is provided herewith a PETITION FOR SUSPENSION OF PROSECUTION FOR THE TIME NECESSARY TO FILE AN AMENDMENT (NEW APPLICATION FILED CONCURRENTLY).

## 5. FEE CALCULATION

<b>BASIC FILING FEE:</b>				<b>\$760.00</b>
Total Claims	5	- 20	= 0 x \$18	\$0.00
Independent Claims	2	- 3	= 0 x \$78	\$0.00
Multiple Dependent Claims				\$260 (if applicable)
Surcharge 37 CFR 1.16(e)				\$130 (if applicable)
<b>TOTAL OF ABOVE CALCULATIONS</b>				<b>\$ 760.00</b>
Reduction by ½ for Filing by Small Entity. Note 37 CFR 1.9, 1.27, 1.28. If applicable, Verified Statement must be attached.				
Misc. Filing Fees (Recordation of Assignment)				
<b>TOTAL FEES SUBMITTED HEREWITH</b>				<b>\$760.00</b>

- ☐ The fee for extra claims is not being paid at this time.

Filing Fee Calculation

6. **SMALL ENTITY STATUS**

- ☐ A Verified Statement to establish small entity under 37 CFR 1.9 and 1.27 is attached
- ☐ has been filed in the prior application and such status is still proper and desired. [37 CFR 1.28(a)]

Filing Fee Calculation (50% of above) \$0.00

7. **DRAWINGS**

[NOTE: DO NOT CHECK THIS IF PRIOR CASE IS NOT TO BE ABANDONED.]

- ☐ Transfer the drawings from the prior application to this application and, subject to Item 16 below, abandon said prior application as of the filing date accorded to this application. A duplicate copy of this request is enclosed for filing in the prior application file.  
[May only be used if signed by (1) applicant, (2) assignee of record or (3) attorney or agent of record authorized by 37 CFR 1.138 and before payment of issue fee.]
- ☐ Transfer the following sheet(s) of drawings from the prior application to this application.
- ☒ New drawings are enclosed    ☒ formal    ☐ informal

8. **PRIORITY - 35 U.S.C. 119**

- ☐ Priority of application Serial No. \_\_\_\_\_ filed on \_\_\_\_\_ in \_\_\_\_\_ [country] is claimed under 35 U.S.C. 119.
- ☐ The certified copy has been filed in prior U.S. application Serial No. \_\_\_\_\_ on \_\_\_\_\_.
- ☐ The certified copy will follow.

9. **RELATE BACK - 35 U.S.C. 120**

- ☒ Amend the Specification by inserting on page 1, after line 15, please insert:

—Related Application Data

This application is a continuation of Application Serial No. 08/876,775, filed on June 16, 1997, which is a continuation of Application Serial No. 08/410,901, filed on March 27, 1995, now U.S. Patent No. 5,640,674, which

is a continuation of Application Serial No. 07/682,050 filed on April 8, 1991,  
now U.S. Patent No. 5,402,413. —

10. **INVENTORSHIP STATEMENT**

☐ With respect to the prior co-pending U.S. application from which this application  
claims benefit under 35 U.S.C. 120, the inventor(s) in this application is (are):

☐ the same

☐ less than those named in the prior application and it is requested that the  
following inventor(s) identified above for the prior application be deleted:

[type name(s) of inventor(s) to be deleted]

☐ The inventorship for all the claims in this application are:

☐ the same

☐ not the same, and an explanation, including the ownership of the various  
claims at the time the last claimed invention was made, is submitted.

11. **ASSIGNMENT**

☒ The prior application is assigned of record to Omnipoint Corporation.

Omnipoint Corporation  
Name of Assignee

1365 Garden of the Gods Road, Colorado Springs, Colorado 80907  
Address of Assignee

\_\_\_\_\_  
Title of person authorized to sign on behalf of assignee

Assignment recorded in PTO on June 10, 1991, Reel 5747, Frame 081 and subsequent  
Change of Name and Address of Assignee from Omnipoint Data Company to Omnipoint  
Corporation recorded in PTO on August 20, 1996, Reel 8095, Frame 0429.

☐ An Assignment of the invention to \_\_\_\_\_ is attached.

12. **TERMINAL DISCLAIMER**

☒ A Terminal Disclaimer is attached.

13. FEE PAYMENT BEING MADE AT THIS TIME

- ☐ Not attached. No filing fee is submitted. [This and the surcharge required by 37 CFR 1.16(e) can be paid subsequently.]
- ☒ Attached.
- ☒ Filing fee. \$760.00
- ☒ Terminal Disclaimer fee. \$110.00
- ☐ Recording assignment. [**\$40.00** 37 CFR 1.21(h)(1)]  
Petition fee for filing by other than all the inventors or  
person on behalf of the inventor where inventor refused  
to sign or cannot be reached.  
[**\$130.00**; 37 CFR 1.47 and 1.17(h)]
- ☐ Petition fee to Suspend Prosecution for the Time  
Necessary to File an Amendment (New Application Filed  
Concurrently.  
[**\$130.00**; 37 CFR 1.103 and 1.17(i)(1)]
- ☐ For processing an application with a specification  
in a non-English language.  
[**\$130.00**; 37 CFR 1.52(d) and 1.17(k)]
- ☐ Processing and retention fee.  
[**\$130.00**; 37 CFR 1.53(d) and 1.21(l)]

**Total Fees Enclosed \$870.00**

14. METHOD OF PAYMENT OF FEES

- ☒ Attached are two checks in the amount of \$870.00.
- ☐ Charge Deposit Account No. **12-2475** in the amount of \$0.00.

15. AUTHORIZATION TO CHARGE ADDITIONAL FEES

The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Deposit Account No. **12-2475**:

- ☒ 37 CFR 1.16 (filing fees)
- ☒ 37 CFR 1.16 (presentation of extra claims)

- ☒ 37 CFR 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)
- ☐ 37 CFR 1.17 (application processing fees)
- ☐ 37 CFR 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 CFR 1.311(b))

**16. INSTRUCTIONS AS TO OVERPAYMENT**

- ☒ Credit Deposit Account No. **12-2475**.
- ☐ Refund

**17. POWER OF ATTORNEY**

- ☐ The power of attorney in the prior application is to
- ☒ The power of attorney in the prior application is to the registered attorneys listed below and members of or associates in the law firm of **LYON & LYON LLP**, 633 West Fifth Street, 47<sup>th</sup> Floor, Los Angeles, California 90071, Registration No. 11,611, whose members are registered to practice in the U.S. Patent and Trademark office:

Roland N. Smoot, Reg. No. 18,718  
Conrad R. Solum, Jr., Reg. No. 20,467  
James W. Geriak, Reg. No. 20,233  
Robert M. Taylor, Jr., Reg. No. 19,848  
Samuel B. Stone, Reg. No. 19,297  
Douglas E. Olson, Reg. No. 22,798  
Robert E. Lyon, Reg. No. 24,171  
Robert C. Weiss, Reg. No. 24,939  
Richard E. Lyon, Jr., Reg. No. 26,300  
John D. McConaghy, Reg. No. 26,733  
William C. Steffin, Reg. No. 26,811  
Coe A. Bloomberg, Reg. No. 26,605  
J. Donald McCarthy, Reg. No. 25,119  
John M. Benassi, Reg. No. 27,483  
James J. Shalek, Reg. No. 29,749  
Allan W. Jansen, Reg. No. 29,035  
Robert W. Dickerson, Reg. No. 29,914  
Roy L. Anderson, Reg. No. 30,240  
David B. Murphy, Reg. No. 31,125

James C. Brooks, Reg. No. 29,898  
Jeffrey M. Olson, Reg. No. 30,790  
Steven D. Hemminger, Reg. No. 30,755

- ☒ The power appears in the original papers in the prior application.

- ☐ The power does not appear in the original papers, but was filed on \_\_\_\_\_ in this application.
- ☐ A new power has been executed and is attached.
- ☒ Address all future communications to:

LYON & LYON LLP  
633 West Fifth Street, 47<sup>th</sup> Floor  
Los Angeles, California 90071  
(714) 751-6606  
(213) 489-1600  
Attention: Christopher A. Vanderlaan

**18. MAINTENANCE OF CO-PENDENCY OF PRIOR APPLICATION**

- ☐ A petition, fee and response has been filed to extend the term in the pending **prior** application until \_\_\_\_\_. A copy of the petition for extension of time in the **prior** application is attached.

**19. CONDITIONAL PETITIONS FOR EXTENSION OF TIME IN PRIOR APPLICATION**

- ☐ A conditional petition for extension of time is being filed in the pending **prior** application. A copy of the conditional petition for extension of time in the **prior** application is attached.


20. ABANDONMENT OF PRIOR APPLICATION

- ☐ Please abandon the prior application at a time while the prior application is pending or when the petition for extension of time or to revive in that application is granted and when this application is granted a filing date so as to make this application co-pending with said prior application. At the same time, please add the words "now abandoned" to the amendment of the specification set forth in Item 13 above.

Respectfully submitted,

LYON & LYON LLP

Dated: DECEMBER 31, 1998

By:   
Christopher A. Vanderlaan  
Reg. No. 37,747  
Attorneys for Applicants

633 West Fifth Street, Suite 4700  
Los Angeles, California 90071-2066  
(213) 489-1600

Enclosures



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	)	Group Art Unit [Parent Case]: 2745
	)	
Robert C. DIXON	)	Examiner [Parent Case]:
	)	Banks-Harold, M.
Serial No. Not Yet Assigned	)	
	)	
Filed: Herewith	)	
	)	
For: WIRELESS CELLULAR	)	
COMMUNICATION SYSTEM (AS	)	
AMENDED)	)	

Continuation application of U.S. Application Ser. No. 08/876,775 filed June 16, 1997, which is a continuation application of U.S. Application Ser. No. 08/410,901 filed March 27, 1995, now U.S. Patent No. 5,640,674, which is a continuation application of U.S. Application Ser. No. 07/682,050 filed April 8, 1991, now U.S. Patent No. 5,402,413.

PRELIMINARY AMENDMENT

Box Patent Application  
Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

Prior to examination, please amend this application as shown herein.

IN THE TITLE

Please amend the title from "THREE-CELL WIRELESS COMMUNICATION SYSTEM" to --WIRELESS CELLULAR COMMUNICATION SYSTEM--.

CERTIFICATE OF MAILING (37 C.F.R. §1.10)

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as 'Express Mail Post Office To Addressee' (Label No. EM351251479US) in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

December 31, 1998  
Date of Deposit

*Connie Kwon*  
Connie Kwon

IN THE CLAIMS

Please cancel claims 1-16, without disclaimer, and without prejudice to pursue at a later time by continuation application or otherwise.

Please add the following new claims:

17. (New) A multiple user wireless communication system, comprising:  
a plurality of cells;  
a base station located in each cell;  
wherein transmitters in a first cell are assigned a first code for modulating radio communication in said first cell;  
whereby radio signals used in said first cell are spread across a bandwidth sufficiently wide that receivers in a second cell, said second cell being adjacent to said first cell, may distinguish communication which originates in said first cell from communication which originates in said second cell;  
whereby said first cell using said first code is not adjacent to any other cell using said first code;  
wherein said base station transmits over a first frequency; and  
wherein user stations in communication with said base station transmit over a second frequency different from said first frequency.
18. (New) The multiple user wireless communication system of claim 17, wherein said base station communicates with said user stations using time division duplexing.
19. (New) A wireless communication system, comprising:  
a plurality of cells;  
a base station; and  
a plurality of user stations;  
wherein said base station is assigned a first transmission frequency for transmitting to a first cell in said plurality of cells, said first transmission frequency not being assigned to any base station for transmitting to any cell in said plurality of cells adjacent said first cell;

wherein said user stations in said first cell are assigned a second transmission frequency, said second transmission frequency not assigned to any user stations in any cell in said plurality of cells adjacent said first cell;

wherein said base station and said user stations in said first cell are assigned one or more distinct codes for modulating radio communication for said first cell.

20. (New) The wireless communication system of claim 19, wherein said base station is assigned a first set of one or more distinct spreading codes for communicating with user stations in said first cell, said first set of one or more distinct spreading codes not being assigned to any base station for communicating in any cell in said plurality of cells adjacent said first cell, and wherein said user stations in said first cell are assigned a second set of one or more distinct spreading codes, said second set of one or more distinct spreading codes not assigned to any user stations in any cell in said plurality of cells adjacent said first cell.

21. (New) The wireless communication system of claim 19, wherein said base station communicates with said user stations using time division duplexing.

#### REMARKS

##### Terminal Disclaimer Filed Herewith

Applicants submit herewith a Terminal Disclaimer in accordance with 37 C.F.R. 1.321, along with the appropriate fee under 37 C.F.R. 1.20(d). The submission of a Terminal Disclaimer should not be construed to mean that Applicants are taking any specific position as to the relationship of the pending claims and those of U.S. Patent No. 5,640,674, from which the present application claims priority under 35 U.S.C. § 120. Rather, its main purpose is to expedite the prosecution of the present application. If the Examiner believes that the filing of a Terminal Disclaimer herein is inappropriate, the Examiner is requested to notify Applicants of such, and Applicants will promptly withdraw it.


Request for Allowance

It is respectfully submitted that the present application is in condition for examination,  
and early allowance is earnestly solicited.

Respectfully submitted,

LYON & LYON LLP

Dated: December 31, 1998

By:   
Christopher A. Vanderlaan  
Reg. No. 37,747

633 West Fifth Street, Suite 4700  
Los Angeles, California 90071-2066  
(213) 489-1600

092447 " 444260

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: ) Group Art Unit [Parent Case]: 2745  
)  
Robert C. Dixon ) Examiner [Parent Case]:  
) Banks-Harold, M.  
Serial No.: not yet assigned )  
)  
Filed: herewith )  
)  
For: WIRELESS CELLULAR )  
COMMUNICATION SYSTEM (AS )  
AMENDED) )

**TERMINAL DISCLAIMER TO OBVIATE DOUBLE PATENTING  
REJECTION [37 CFR 1.321(b)]**

**Identification of Person(s) Making This Disclaimer**

I, CHRISTOPHER A. VANDERLAAN, represent that I am

- \_\_\_\_\_ an inventor of this invention  
\_\_\_\_\_ an assignee of this invention  
\_\_\_\_\_ a representative authorized to sign in behalf of the assignee identified below.  
  X   an attorney or agent of record for this application.

01/13/1999 MGDORDON 00000041 09224477

02 FC:148

110.00 OP

CERTIFICATE OF MAILING (37 C.F.R. §1.10)

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as 'Express Mail Post Office To Addressee' (Label No. EM 351251479 US) in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

December 31, 1998  
Date of Deposit  
LA-67330.1

Connie Kwon  
Connie Kwon

**Identity of Assignee and Title of Disclaimant (if applicable)**

The assignee is

Name of assignee: Omnipoint Data Company, presently known as Omnipoint Corporation

Address of assignee: 1365 Garden of the Gods Road, Colorado Springs, Colorado 80907

Title of disclaimant authorized to sign on behalf of assignee. \_\_\_\_\_

**Recordal of Assignment in PTO (if applicable)**

  X   The assignment was recorded on June 10, 1991,  
Reel 5747, Frames 081  
and subsequent Change of Name and Address of Assignee from Omnipoint Data Company to  
Omnipoint Corporation was recorded on August 20, 1996,  
Reel 8095, Frames 0429.

\_\_\_\_\_ Authorization for recordal of the assignment is separately attached, and was mailed to the U.S.  
Patent and Trademark Office on \_\_\_\_\_.

**Extent of Interest**

The extent of the Assignee's interest in the instant application is to

  X   the whole of the invention.

\_\_\_\_\_ a sectional interest in the invention as follows *[here state the exact interest of the disclaimant(s)]*:

**Establishing Right of Assignee to Take Action (37 CFR 3.73(b))**  
(if applicable)

\_\_\_\_\_ I, the undersigned, have reviewed all the documents in the chain of title of the patent  
application identified above, and to the best of my knowledge and belief, title is in the  
assignee identified above.

**Disclaimer**

The terminal part of any statutory term of any patent granted on the above-identified application, which  
would extend beyond the expiration date of the full statutory term defined in 35 U.S.C. 154 to 156 and 173 of:

  X   United States Patent No. 5,640,674, as presently shortened by any terminal  
disclaimer,

**DOCKET NO. 239/104**  
**-- PATENT --**

\_\_\_\_\_ Any patent granted on Application Serial No. \_\_\_\_\_,

is hereby disclaimed, except as provided below, and it is agreed that any patent so granted on the above-identified application shall be enforceable only for, and during, such period that the legal title to said patent shall be the same as the legal title to:

  X   United States Patent No. 5,640,674.

\_\_\_\_\_ Any patent granted on Application Serial No. \_\_\_\_\_.

This agreement runs with any patent granted on the above-identified application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, disclaimant does not disclaim any terminal part of any patent granted on the above-identified application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 to 156 and 173 of:

  X   United States Patent No. 5,640,674, as presently shortened by any terminal disclaimer,

\_\_\_\_\_ Any patent granted on Application Serial No. \_\_\_\_\_

in the event that the prior patents later: expire for failure to pay a maintenance fee, are held unenforceable, are found invalid, are statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321(a), have all claims cancelled by a reexamination certificate, are reissued, or are otherwise terminated prior to expiration of their full statutory term as presently shortened by any terminal disclaimer, except for the separation of legal title stated above.

**Fee Status**

*(37 CFR 1.20(d) and 37 CFR 1.321)*

  X   Other than a small entity -- fee \$ 110.00

\_\_\_\_\_ Small entity -- fee \$ 55.00

\_\_\_\_\_ A verified statement is attached.

\_\_\_\_\_ A verified statement was filed on \_\_\_\_\_ in parent application Serial No. \_\_\_\_\_.

**Fee Payment**

  X   Attached is a check covering the sum of \$ 110.00.

  X   Charge Deposit Account No. **12-2475** for any fee deficiency required by this paper.

\_\_\_\_\_ Charge Deposit Account No. **12-2475** the sum of \$ \_\_\_\_\_. A duplicate of this disclaimer is attached.

  X   For submissions on behalf of an organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the organization.

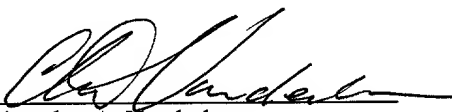
DOCKET NO. 239/104  
-- PATENT --

\_\_\_\_\_ As I am not registered to practice before the Office, the undersigned is an attorney or agent of record. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

  X   The undersigned is an attorney or agent of record.

LYON & LYON LLP

Dated: DECEMBER 31, 1998

By:   
Christopher A. Vanderlaan  
Reg. No. 37,747  
Attorney for Applicant

633 West Fifth Street, 47th Floor  
Los Angeles, CA 90071  
(213) 489-1600



This application is submitted in the name of inventor

Robert C. Dixon, a citizen of the United States residing in Colorado Springs, Colorado, assignor to Omnipoint Data Company, a Delaware corporation having an office at 2120 Hollow Brook Drive, Colorado Springs, Colorado 80918.

## S P E C I F I C A T I O N

### TITLE OF THE INVENTION

THREE-CELL WIRELESS COMMUNICATION SYSTEM

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

This invention relates to cellular radio communication. More specifically, this invention relates to a cellular radio communication system including a repeated pattern of three cells.

#### 2. Description of Related Art

In a wireless communication system it is generally necessary for a receiver to distinguish between those signals in its operating region that it should accept and those it should reject. A common method in the art is frequency division (FDMA), in which a separate frequency is assigned to each communication

1 channel. Another common method in the art is time division  
2 (TDMA), in which a separate timeslot in a periodic time frame is  
3 assigned to each communication channel.

4  
5 One problem which has arisen in the art is that  
6 contiguous coverage of a large area using radio communication has  
7 required a cellular configuration with a large number of cells,  
8 and thus with only a small number of frequencies available per  
9 cell. In an FDMA system, all relatively proximate cells, not  
10 just adjacent cells, must operate on different frequencies, and  
11 frequencies may be reused only sufficiently far away that  
12 stations using those frequencies no longer interfere. In  
13 general, with homogenous conditions and equal-power transmitters,  
14 the distance between perimeters of like-frequency cells must be  
15 at least two to three times the diameter of a single cell. This  
16 had led to a seven-cell configuration now in common use for  
17 cellular networks.

18  
19 Another problem which has arisen in the art when the  
20 cells are disposed in a three-dimensional configuration,  
21 particularly in low-power applications where many transmitters  
22 are in close proximity. In addition to avoiding interference  
23 from close transmitters, these systems may require complex  
24 techniques for handing off mobile stations from one cell to  
25 another, and for reassigning unused frequencies. This makes the  
26 physical location of each cell's central station critical, and  
27 thus requires careful coordination of an entire communication  
28 system layout.

U.S. Patent No. 4,790,000 exemplifies the art.

Accordingly, an object of this invention is to provide a wireless communication system including a pattern having a reduced number of cells. Other and further objects of this invention are to provide a communication system which is less complex, which allows for reduced cell size, which can easily be extended from a two-dimensional to a three-dimensional configuration, which can reject interference, and which allows independent installation of multiple communication systems.

#### SUMMARY OF THE INVENTION

The invention provides a wireless communication system including a repeated pattern of cells, in which base station transmitters and user station transmitters for each cell may be assigned a spread-spectrum code for modulating radio signal communication in that cell. Accordingly, radio signals used in that cell are spread across a bandwidth sufficiently wide that both base station receivers and user station receivers in an adjacent cell may distinguish communication which originates in one cell from another. (Preferably, adjacent cells may use distinguishable frequencies and distinguishable codes, but it is sufficient if adjacent cells use distinguishable frequencies and identical codes.) A repeated pattern of cells allows the codes each to be reused in a plurality of cells.

1 In a preferred embodiment, a limited number (three is  
2 preferred) of spread-spectrum codes may be selected for minimal  
3 cross-correlation attribute, and the cells may be arranged in a  
4 repeated pattern of three cells, as shown in figure 1. Station  
5 ID information may be included with data communication messages  
6 so that base stations and user stations may distinguish senders  
7 and address recipients. Mobile user stations may be handed off  
8 between base stations which they move from one cell to the next.

9  
10 In a preferred embodiment, codes may be assigned  
11 dynamically for each cell by each of a plurality of independent  
12 communication systems, after accounting for use by other systems.  
13 Preferably, if a control station for a second system determines  
14 that two codes are in use closest to it, it may select a third  
15 code for use in its nearest cell, and dynamically assign codes  
16 for other cells to account for that initial assignment. A  
17 control station for the first system may also dynamically  
18 reassign codes to account for the presence of the second system.  
19 Preferably, this technique may also be applied to a three-  
20 dimensional configuration of cells.

21  
22 In a preferred embodiment, time division and frequency  
23 division reduce the potential for interference between station  
24 transmitters. In a preferred embodiment, each independent  
25 communication system may dynamically assign (and reassign) a  
26 frequency or frequencies to use from a limited number (three is  
27 preferred) of frequencies, after accounting for use by other  
28

1 systems, similarly to the manner in which codes are dynamically  
2 assigned and reassigned from a limited number of codes.

### 3 4 BRIEF DESCRIPTION OF THE DRAWINGS

5  
6 Figure 1 shows a repeated pattern of three cells.

7  
8 Figure 2 shows a wireless communication system.

9  
10 Figure 3 shows a region with a plurality of independent  
11 communication systems.

### 12 13 DESCRIPTION OF THE PREFERRED EMBODIMENT

14  
15 Figure 1 shows a repeated pattern of three cells.

16  
17 Figure 2 shows a wireless communication system.

18  
19 A wireless communication system 201 for communication  
20 among a plurality of user stations 202 includes a plurality of  
21 cells 203, each with a base station 204, typically located at the  
22 center of the cell 203. Each station (both the base stations 204  
23 and the user stations 202) generally comprises a receiver and a  
24 transmitter.

25  
26 In a preferred embodiment, a control station 205 (also  
27 comprising a receiver and a transmitter) manages the resources of  
28 the system 201. The control station 205 assigns the base station

1 204 transmitters, 1 user station 202 transmitters in each cell  
2 203 a spread-spectrum code for modulating radio signal  
3 communication in that cell 203. Accordingly, radio signals used  
4 in that cell 203 are spread across a bandwidth sufficiently wide  
5 that both base station 204 receivers and user station 202  
6 receivers in an adjacent cell 206 may distinguish communication  
7 which originates in the first cell 203 from communication which  
8 originates in the adjacent cell 206.

9  
10 Preferably, adjacent cells 203 may use distinguishable  
11 frequencies and distinguishable codes, but it is sufficient if  
12 adjacent cells 203 use distinguishable frequencies and identical  
13 codes. Thus, cells 203 which are separated by an intervening  
14 cell 203 may use the same frequency and a distinguishable code,  
15 so that frequencies may be reused in a tightly packed repeated  
16 pattern. As noted herein, spread-spectrum codes which are highly  
17 orthogonal are more easily distinguishable and therefore  
18 preferred.

19  
20 The cells 203 may be disposed in the repeated pattern  
21 shown in figure 1. A cell 203 will be in one of three classes: a  
22 first class A 207, a second class B 208, or a third class C 209.  
23 No cell 203 of class A 207 is adjacent to any other cell 203 of  
24 class A 207, no cell 203 of class B 208 is adjacent to any other  
25 cell 203 of class B 208, and no cell 203 of class C 209 is  
26 adjacent to any other cell 203 of class C 209. In a preferred  
27 embodiment, three spread-spectrum codes may be preselected, such  
28

as for minimal correlation attribute, and one such code assigned to each class of cells 203.

However, it would be clear to one of ordinary skill in the art, after perusal of the specification, drawings and claims herein, that alternative arrangements of the cells 203 would also be workable. For example, the cells 203 might be arranged in a different pattern. Alternatively, each base station 204 and each user station 202 may be assigned a separate code, which may then be used to identify that station. Hybrids between these two extremes, such as assigning a common code to a designated class of stations, may be preferred where circumstances indicate an advantage. It would be clear to one of ordinary skill in the art, that such alternatives would be workable, and are within the scope and spirit of the invention.

In a preferred embodiment, only a single code is used for all base stations 204 and user stations 202 in a single cell 203. A message 210 which is transmitted by a base station 204 or a user station 202 may comprise a portion 211 which comprises station ID information, such as a unique ID for the transmitting station. This allows base stations 204 and user stations 202 to distinguish the sender and to address the recipient(s) of the message 210.

When a mobile user station 202 exits the first cell 203 and enters the adjacent cell 206, the user station 202 is "handed off" from the first cell 203 to the adjacent cell 206, as is well

known in the art. Determining when the user station 202 should be handed off may be achieved in one of several ways, including measures of signal strength, bit error rate, cross-correlation interference, measurement of distance based on arrival time or position locationing, and other techniques which are well known in the art. Alternatively, the mobile user station 202 may simply lose communication with the base station 204 for the first cell 203 and re-establish communication with the base station 204 for the adjacent cell 206, also by means of techniques which are well known in the art.

Figure 3 shows a region with a plurality of independent communication systems.

In a preferred embodiment, a single region 301 may comprise both a first system 302 and a second system 303 for wireless communication. The cells 203 of the first system 302 will be distinct from the cells 203 of the second system 303. Rather than disposing the cells 203 of either the first system 302 or the second system 303 in repeated patterns which may clash, the cells 203 each may have a code which is dynamically assigned (or reassigned), with the first system 302 accounting for use by the second system 303 and vice versa.

In a preferred embodiment, the first system 302 may assign a code to each of the cells 203 based on a limited set of codes and a repeated pattern such as that in figure 1. The second system 303 may then determine those codes in the limited



1 set which are in closest use to the control station 205 for the  
2 second system 303. The second system 303 may then select one of  
3 the remaining codes, and assign the selected code to the cell 203  
4 comprising its control station 205. The control station 205 for  
5 the second system 303 may then assign a code to each of the cells  
6 203 in the second system 303 based on the same limited set of  
7 codes and a repeated pattern such as that in figure 1. In a  
8 preferred embodiment, the limited set may comprise three codes,  
9 and up to two such closest codes may be determined.

10  
11 More generally, the first system 302 and the second  
12 system 303 may each assign a code to each of the cells 203 in  
13 their respective systems, based on a limited set of common codes.  
14 For each of the cells 203, either the first system 302 or the  
15 second system 303 will manage the base station 204 for that cell  
16 203, and thus be in control of that cell 203. The system in  
17 control of that cell 203 may dynamically determine those codes  
18 from the limited set which are in closest use to the base station  
19 204 for the cell 203, select one of the remaining codes, and  
20 assign the selected code to the cell 203.

21  
22 It would be clear to one of ordinary skill in the art,  
23 after perusal of the specification, drawings and claims herein,  
24 that application of the disclosed techniques for dynamic  
25 assignment (and reassignment) of codes to cells 203 to a three-  
26 dimensional configuration of cells 203, would be workable, and is  
27 within the scope and spirit of the invention.  
28

1 In a preferred embodiment, time division is also used.  
2 A pulsed-transmitter based system, a minimized number of pulses,  
3 and a minimized duration of each pulse reduce the probability of  
4 collisions, as is well known in the art. Multiple transmitters  
5 may thus all use the same code and the same frequency, as is well  
6 known in the art.

7  
8 In a preferred embodiment, frequency division is also  
9 used. Three techniques are disclosed; the third is a preferred  
10 embodiment for many envisioned environments. However, it would  
11 be clear to one of ordinary skill in the art, after perusal of  
12 the specification, drawings and claims herein, that other  
13 techniques would be workable, and are within the scope and spirit  
14 of the invention. It would also be clear to one of ordinary  
15 skill that these techniques may be used with spread-spectrum  
16 frequency offset techniques instead of frequency division.

17  
18 (1) If the region 301 comprises only the first system  
19 302 alone, two frequencies may be used. All of the base stations  
20 204 use a first frequency, while all of the user stations 202 use  
21 a second frequency. Accordingly, all of the base stations 204  
22 can receive signals from all of the user stations 202, but the  
23 use of multiple sufficiently orthogonal spread-spectrum codes  
24 allows each base station 204 to reject signals from outside its  
25 own cell 203. (Spread-spectrum codes which are highly orthogonal  
26 are preferred.) The first frequency and the second frequency  
27 must be sufficiently separated so that interference does not  
28 occur.

1  
2 (2) If the region 301 comprises both the first system  
3 302 and the second system 303, frequencies may be assigned  
4 dynamically. All of the base station 204 transmitters in each  
5 system use a first frequency, selected from a limited set. All  
6 of the user station 202 transmitters in each system use a second  
7 frequency, also selected from a limited set, not necessarily the  
8 same set. Moreover, each system may dynamically assign and  
9 reassign frequencies in like manner as disclosed above for  
10 dynamic assignment and reassignment of codes. In like manner as  
11 to codes, in a preferred embodiment, the limited set may comprise  
12 three frequencies, and up to two such closest frequencies may be  
13 determined.

14  
15 (3) If the region 301 comprises both the first system  
16 302 and the second system 303, frequencies may be assigned  
17 dynamically. All of the base station 204 transmitters and all of  
18 the user station 202 transmitters in each cell 203 use a single  
19 frequency, selected from a limited set. Each base station 204  
20 dynamically determines those frequencies from the limited set  
21 which are in closest use to it, and selects one of the remaining  
22 frequencies for use in the cell 203. The base station 204  
23 transmitters and the user station 202 transmitters may be time-  
24 division duplexed. (Time-division duplexing is well known in the  
25 art.) In like manner as to codes, in a preferred embodiment, the  
26 limited set may comprise three frequencies, and up to two such  
27 closest frequencies may be determined.

1           The amount of separation required between frequencies  
2 (while also using code-division and time-division techniques) is  
3 dependent upon distance between the user stations 202 in each  
4 cell 203, as well as upon the technique used for modulation and  
5 demodulation encoded signals. As is well known in the art, some  
6 modulation techniques allow for overlapping wideband signals  
7 whose center frequencies are offset by a minimum amount necessary  
8 to distinguish between otherwise cross-correlating signals. In a  
9 preferred embodiment, such modulation techniques may be used,  
10 allowing more efficient use of frequency spectrum and allowing  
11 frequencies to be reused at closer proximity.

### 12 13 Alternative Embodiments

14  
15           While preferred embodiments are disclosed herein, many  
16 variations are possible which remain within the concept and scope  
17 of the invention, and these variations would become clear to one  
18 of ordinary skill in the art after perusal of the specification,  
19 drawings and claims herein.

20  
21           For example, it would be clear to one of ordinary skill  
22 in the art, after perusal of the specification, drawings and  
23 claims herein, that other and further techniques, such as  
24 adjustable power control, cell sectoring, directional antennas,  
25 and antennae diversity, may be used to enhance a wireless  
26 communication system embodying the principles of the invention.  
27 Moreover, it would be clear to one of ordinary skill that a  
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1 system also employing such other and further techniques would be  
2 workable, and is within the scope and spirit of the invention.

SECRET

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CLAIMS

I claim:

1. A wireless communication system, comprising  
repeated pattern of cells, each cell having a base  
station;

a user station;

wherein base station transmitters and user station  
transmitters in a cell are assigned a spread-spectrum code for  
modulating radio communication in that cell;

whereby radio signals used in that cell are spread  
across a bandwidth sufficiently wide that both base station  
receivers and user station receivers in an adjacent cell may  
distinguish communication which originates in one cell from  
another; and

whereby said codes are each reused in a plurality of  
cells.

2. A wireless communication system as in claim 1,  
wherein said repeated pattern comprises a three-dimensional  
configuration.

3. A wireless communication system as in claim 1,  
wherein said repeated pattern comprises the pattern shown in  
figure 1.

1 4. A wireless communication system in claim 1,  
2 wherein said user station transmitters emit data communication  
3 messages which include station identification information.  
4

5 5. A wireless communication system as in claim 1,  
6 wherein said codes are assigned dynamically for each cell.  
7

8 6. A wireless communication system as in claim 1,  
9 wherein said codes are assigned dynamically for each cell by each  
10 of a plurality of independent communication systems, after  
11 accounting for use by other systems.  
12

13 7. A wireless communication system as in claim 6,  
14 wherein said use is concurrent use.  
15

16 8. A wireless communication system as in claim 6,  
17 wherein said use is prior use.  
18

19 9. A wireless communication system as in claim 1,  
20 wherein said codes comprise a set of codes with minimal cross-  
21 correlation attribute.  
22

23 10. A wireless communication system as in claim 1,  
24 wherein said codes comprise a limited number of  
25 predetermined codes; and

26 wherein said cells are arranged in a repeated pattern  
27 of three cells.  
28

11. A wireless communication system as in claim 10,  
wherein said limited number is three.

12. A wireless communication system as in claim 10,  
further comprising time division and frequency division.

13. A wireless communication system as in claim 12,  
wherein a plurality of frequencies are assigned dynamically.

14. A wireless communication system as in claim 12,  
wherein a plurality of frequencies are assigned dynamically by  
each of a plurality of independent communication systems, after  
accounting for use by other systems.

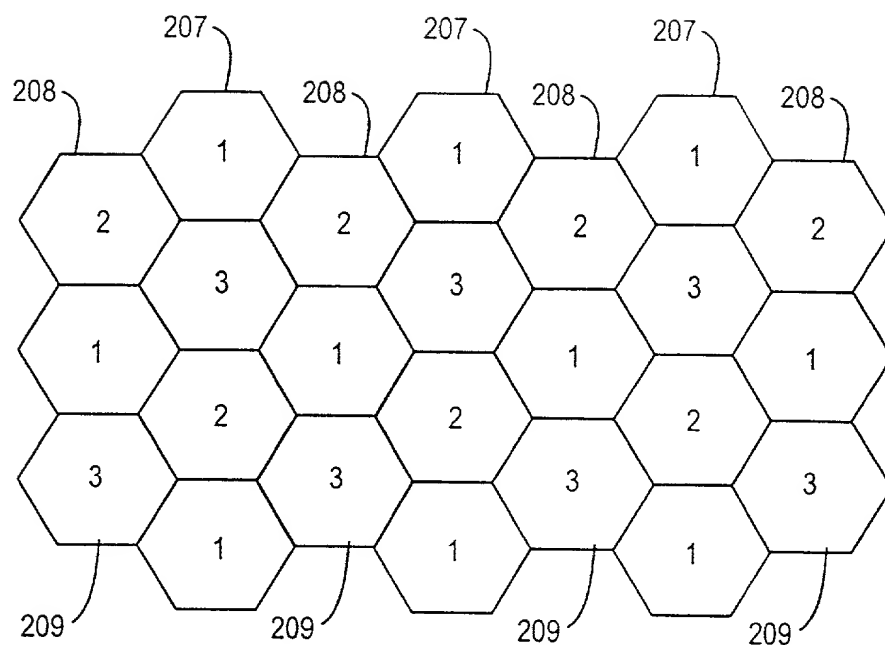
15. A wireless communication system as in claim 14,  
wherein said use is concurrent use.

16. A wireless communication system as in claim 14,  
wherein said use is prior use.

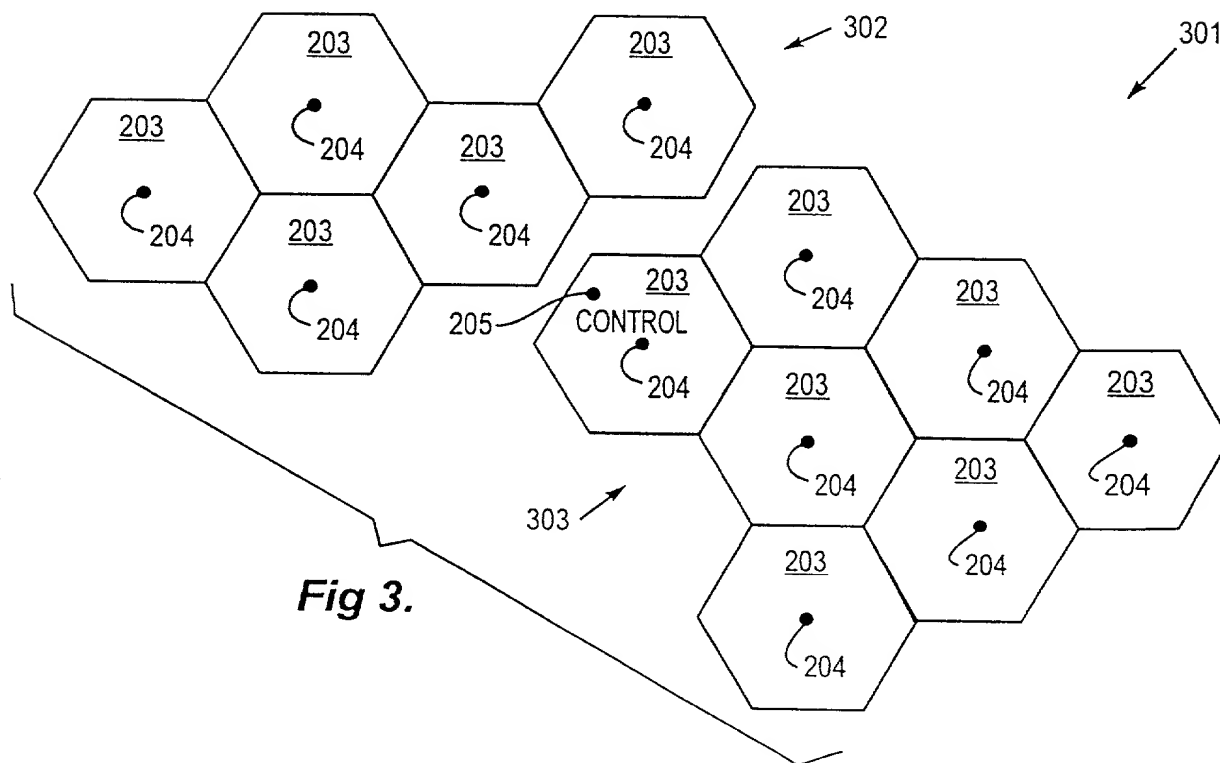


ABSTRACT OF THE DISCLOSURE

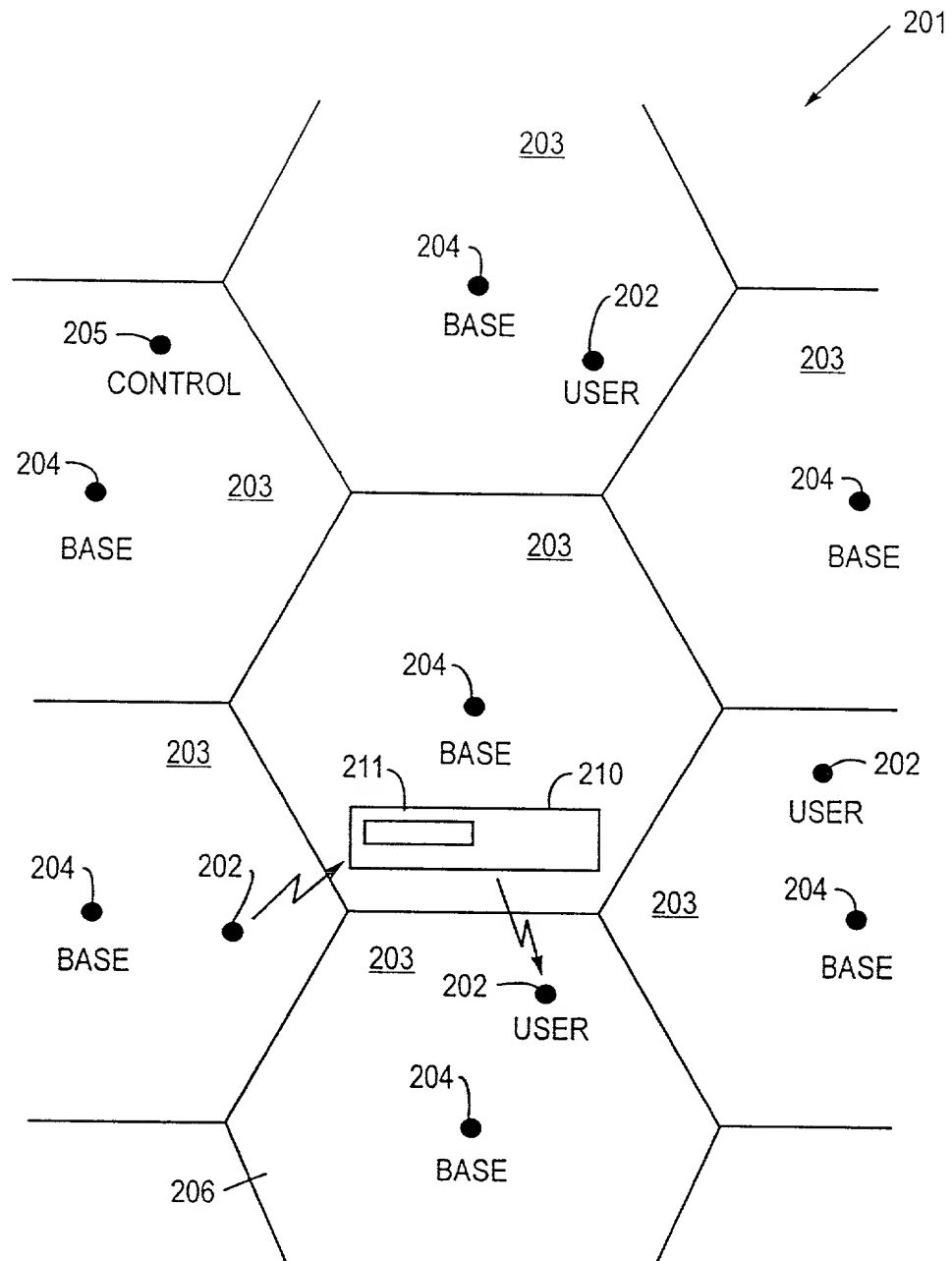
1  
2  
3 A wireless communication system including a repeated  
4 pattern of cells, in which base station transmitters and user  
5 station transmitters for each cell may be assigned a spread-  
6 spectrum code for modulating radio signal communication in that  
7 cell. Radio signals used in that cell are spread across a  
8 bandwidth sufficiently wide that both base station receivers and  
9 user station receivers in an adjacent cell may distinguish  
10 communication which originates in one cell from another.  
11 Adjacent cells may use distinguishable frequencies and  
12 distinguishable codes, but it is sufficient if adjacent cells use  
13 distinguishable frequencies and identical codes. A repeated  
14 pattern of cells allows the codes each to be reused in a  
15 plurality of cells.  
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**Fig.1**



**Fig 3.**



**Fig. 2**

**DECLARATION**  
**Utility Application**

LYON & LYON  
DOCKET INFORMATION

192/270

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled "THREE CELL WIRELESS COMMUNICATION

SYSTEM", the specification of which

**Check One**

☐ is attached hereto.

☒ was filed on April 8, 1991 as

Application Serial No. 07/682,050

and was amended on \_\_\_\_\_  
(if applicable)

I have read the applicable statutes and rules reprinted on the reverse side of this declaration which I understand to describe subject matter which is material under 37 CFR 1.56(a).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above. I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a). I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Application Number	Country	Date of Filing	Priority Yes ✓	Claimed No ✓

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

Application Number	Date of Filing	Status—Patented, Pending or Abandoned

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	RESIDENCE & CITIZENSHIP	City	State or Foreign Country		Country of Citizenship			
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I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signature of Inventor 201	<i>Robert C. Dixon</i>
Date XX	31 May 1991

Signature of Inventor 204	
Date	

Signature of Inventor 202	
Date	

Signature of Inventor 205	
Date	

Signature of Inventor 203	
Date	

Signature of Inventor 206	
Date	

(Signatures should conform to names as presented at 201 et seq. above.)

## POWER OF ATTORNEY

OMNIPOINT DATA COMPANY, INC.

, assignee(s) of the application for United States  
Letters Patent for an improvement in "THREE CELL WIRELESS COMMUNICATION SYSTEM"

(Title)

by ROBERT C. DIXON

(Inventors)

☐ executed on even date herewith, or☒ having Serial No. 07/682,050 filed April 8, 1991

a copy of the assignment of which is attached hereto, do(es) hereby appoint as attorneys of record with full power of substitution and revocation, to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: Roland N. Smoot, Reg. No. 18,718; Conrad R. Solum, Jr., Reg. No. 20,467; James W. Geriak, Reg. No. 20,233; Robert M. Taylor, Jr., Reg. No. 19,848; Samuel B. Stone, Reg. No. 19,297; Douglas E. Olson, Reg. No. 22,798; Robert E. Lyon, Reg. No. 24,171; James J. Short, Reg. No. 25,922; Robert C. Weiss, Reg. No. 24,939; William E. Thomson, Jr., Reg. No. 20,719; Richard E. Lyon, Jr., Reg. No. 26,300; John D. McConaghy, Reg. No. 26,773; William C. Steffin, Reg. No. 26,811; Coe A. Bloomberg, Reg. No. 26,605; J. Donald McCarthy, Reg. No. 25,119; John M. Benassi, Reg. No. 27,483; James H. Shalek, Reg. No. 29,749; Allan W. Jansen, Reg. No. 29,395; Robert W. Dickerson, Reg. No. 29,914; Kenneth D'Alessandro, Reg. No. 29,144; Roy L. Anderson, Reg. No. 30,240; David B. Murphy, Reg. No. 31,125; Bradford J. Duft, Reg. No. 32,219; James C. Brooks, Reg. No. 29,898; Jeffrey M. Olson, Reg. No. 30,790; and  
STEVEN A. SWERNOFSKY Reg. No. 33,040

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I, the undersigned, declare that I am the (an) assignee of the above-identified application or, if the assignee is a corporation, partnership or other association, I am authorized to make this appointment on behalf of the assignee and I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Full Name of Assignee OMNIPOINT DATA CO., INCORPORATED	
Post Office Address 242 Marlboro Street Boston, MA 02116	
Signature of Declarant or Assignee X <i>Robert C. Dixon</i>	Date X May 30, 1991

Full Name of Assignee	
Post Office Address	
Signature of Assignee	Date

Full Name of Declarant If Other Than Assignee	
Title of Declarant	
Address of Declarant	